



5.1. GENERAL PEDESTRIAN FACILITY GUIDELINES

Guidelines for the placement and design of pedestrian facilities should be flexible to some extent so that context-sensitive design solutions can be implemented, but should adhere to standards established by the American Association of State Highway and Transportation Officials (AASHTO), the Manual on Uniform Traffic Control Devices (MUTCD), and the NCDOT. Several overall guidelines for facility development are highlighted below.

- Give transportation priority to the completion of pedestrian routes to schools, neighborhood shopping areas, parks, and transit stops.
- Incorporate the natural and historical linear aspects of the city into pedestrian projects.
- Ensure that the safety and convenience of pedestrians are not compromised by transportation improvements aimed at motor vehicle traffic.
- Ensure that the pedestrian circulation system is safe and accessible to children, seniors and the disabled.
- Street furniture, vendors, water fountains, bicycle racks, lighting, and other pedestrian amenities should be welcomed, but also be placed out of the immediate pedestrian travel area.
- Establish links between sidewalks, trails, parks, and the rest of the community.
- Retain public pedestrian access when considering private right-of-way requests.
- Support changes to existing policies that would enhance pedestrian travel.
- The pedestrian system should connect to residential, commercial, industrial, educational, and recreational areas.
- Off-site street improvements or enhanced bicycle and pedestrian facilities may be required as a condition of approval for land divisions or other development permits.
- Aesthetics and landscaping shall be a part of the transportation system.
- Coordinate transportation planning and efforts with neighboring municipalities.

A number of specific pedestrian improvement projects are proposed in this plan. These projects will play an important role in helping to improve the walkability of the City; however, it is even more important to ensure that appropriate pedestrian accommodations are made with future development. It is useful for the City to consider a set of guiding design principles that cater to the needs of pedestrians and the general means by which these needs are to be met. Some basic principles for incorporating pedestrian accommodations in a transportation system include the following:

- It should be accessible.
- It should connect to the places where people want to go.
- It should be easy to use and convenient.
- It should provide a sense of place and make an effort to be appealing to the senses.
- It should be well maintained.
- External factors such as noise, crime potential, exposure to the elements, and hazardous objects should be minimized.
- It should be used for multiple purposes such as dining, shopping, and special events so long as it does not contradict any of these principles.



5.2. SPECIFIC FACILITY DESIGN RECOMMENDATIONS

Design considerations for a variety of types of pedestrian facilities are highlighted on the following pages. These design considerations are not intended to serve as “standards”, since the most appropriate design will vary from project to project. However, suggested minimums and guidelines are addressed for the following types of facilities:

- Sidewalks and planting strips/furniture zones;
- Intersections and crosswalks;
- Shared-use Paths;
- Lighting, Landscaping, and Signage.



Sidewalks

Clearly, no pedestrian system is complete without sidewalks. Even if no pedestrian travel exists, studies show that walking can be expected to increase when the facilities are provided, and walking levels are highest when the pedestrian routes are complete and continuous. It is relatively easy to design a policy that requires new development to include sidewalks in their construction, but it can be difficult to retrofit new sidewalks into existing communities. The American Association of State Highway and Transportation Officials (AASHTO) recommends the construction of sidewalks on all city streets, including those in rural areas. The Institute of Transportation Engineers (ITE) recommends sidewalk installation on both sides of the street whenever possible for new urban and suburban streets, especially in commercial areas, residential areas with four or more units per acre, or residential areas on major arterials and collectors. If sidewalks on both sides of the road are not possible, lower density rural residential areas might adequately serve its pedestrians with a sidewalk on only one side and or four-foot wide shoulders.

Although separate pedestrian and automobile corridors are necessary on any roadway other than a low-speed driveway, sidewalks are the most useful along roadways with a fair amount of traffic volume and with speeds higher than 25 miles per hour. The higher the speed of traffic, the more the need may exist to route the pedestrian away from that road. Store frontage walkways or shared-use paths that provide the pedestrian with multiple options are sometimes preferred. Sidewalks should never be intentionally built directly adjacent to a roadway if the space exists for a buffer such as a planting strip, on-street parking, a furniture zone or bicycle lanes. Because of frequent intersections, dips, and narrow widths, sidewalks are not meant for bicycles other than new riders who are accompanied by a pedestrian trainer. One of the most common reasons for bicycle/car collisions are attributed to that rider being on the sidewalk. Bicycle provisions are addressed briefly in this plan as a traffic calming measure, but should be addressed completely in a separate plan.

ITE Recommendations for Sidewalks:

- *Central Business District: Wide enough to accommodate users. Minimum 8 feet.*
- *Commercial area outside the central business district: 7 feet wide if no planting strip is possible, or 5 feet wide with a 2-8 foot planting strip (Wider planting strips*

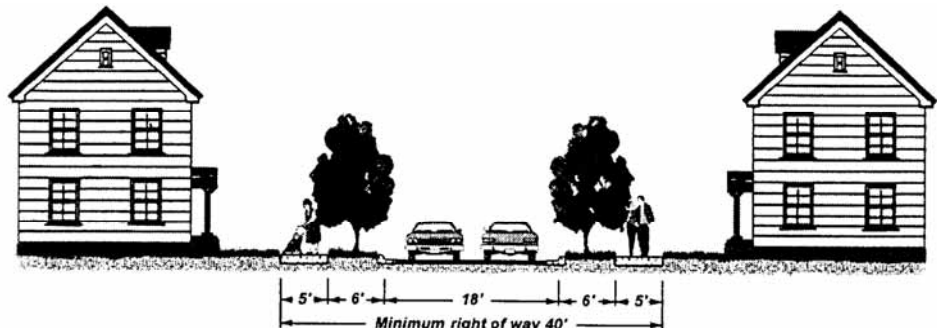


accommodate greater buffers from traffic and the opportunity to plant large shade trees).

- Residential areas should have 5 foot-wide sidewalks with a minimum of two-foot wide planting strips.
- 4 to 8 foot wide planting strips or furniture zones are recommended along all sidewalks to provide separation from vehicles. This space is useful for landscaping, lighting, poles, trash receptacles, signage, water fountains, benches, weather debris, bike racks, and curb ramps. Six foot wide minimum buffer strips between the sidewalk and the curb are required for the correct slope needed to accommodate ADA requirements for curb ramps while maintaining the sidewalks' 2 % maximum cross slope (see section 5.4). Eight foot wide buffers are recommended for the planting of any shade tree.
- Sidewalks should be clear of obstructions such as utility poles, sign posts, fire hydrants, bike racks, newspaper stands, etc. These objects must remain in the furniture zone or planting buffer strip.
- Vertical clearance should be at least 7 feet from ground level to the bottoms of signs or the lowest tree branches.
- Increasing sidewalk widths by 2 - 3 feet would accommodate shoulder-high intrusions like building walls, bridge railings, and fences.
- Maximum cross-slope of 1:50 (2%) is considered to be level. Limit running slope to 5% (1:20), or no greater than 8.33% (1:12) where topography requires it. Ramps with level upper and lower landings are necessary for ADA requirements.



The recommendations of this plan are to require sidewalks in neighborhoods and on arterial roads to be a minimum of 5 feet wide. Planting strips with a minimum width of 6-8 feet should be required as 6 feet is required to keep the slope necessary for curb ramps to a sidewalk, and 8 feet is the recommended width for medium and large shade trees.



A typical neighborhood cross-section street from NCDOT's TND Street Design Guidelines

Sidewalks in mixed-use and higher density commercial corridors such as the Central Business District and the Neighborhood Business Districts that should appear in Pedestrian Oriented Development Districts should be a minimum 6-15 feet wide with 8-10 foot wide furniture zones.

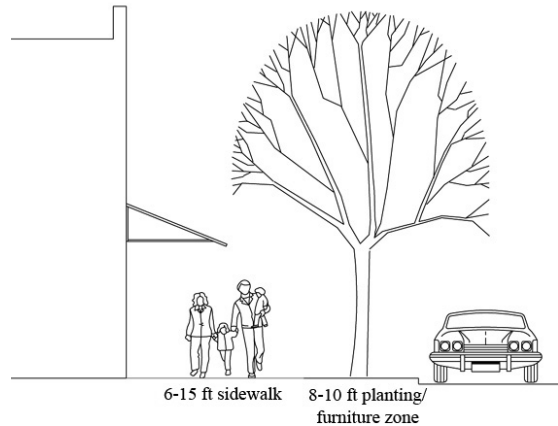


Frontage Zone:

Store frontages should be encouraged to be built with small setbacks close to the sidewalks with a frontage zone of 1-3 feet from the sidewalk travel area.

Sidewalk Zone:

The width requirements for the sidewalks increase to provide for the increased use in higher density, mixed use or commercial centers. This sidewalk zone continues immediately adjacent to the building frontage zone and extends a minimum of 6 to 15 feet from that frontage zone. This area should be kept completely clear of all obstacles so that pedestrians have a clear walkway. All benches, poles, racks, newspaper stands, signs, etc should be placed in the *Furniture Zone*.



Furniture Zone:

Furniture zones are different from planting strips in that they can, in many places, be paved areas adjacent to the sidewalk for street furniture such as benches, trash receptacles, dining, lighting, bicycle racks, water fountains, informational boards, or for additional walkway width. Tree planters should be added to these furniture zones by policy and should be placed every 25-50 feet, depending on type and depending on the demand for sidewalk furniture and parking. Trees in the Poplar family should not be planted in planting strips because of the extensive pavement damage that their roots can cause. Shade trees require a minimum width of 8 feet, while the minimum width suggestions for furniture zones are 8-10 feet. If space is minimal, a six foot minimum width is acceptable to provide the slope necessary for curb ramps.

On some roadways, on-street parking pockets could alternate in-between the occasional landscaping or sidewalk furniture in the space that is otherwise utilized as a furniture zone. On-street parking pockets require a minimum width of 7 feet. Using pervious materials for parking, the furniture/planting strip zone, and for some parts of the frontage zone could reduce storm drainage concerns.

Intersections

Driveways



Sidewalks that ramp down to driveways gives the false impression to the pedestrian and to the driver that this section of the sidewalk is the drivers' territory, plus it makes conditions difficult for the disabled, along with common walkers and runners. Sidewalk and driveway standards that require new and maintained driveways to ramp up



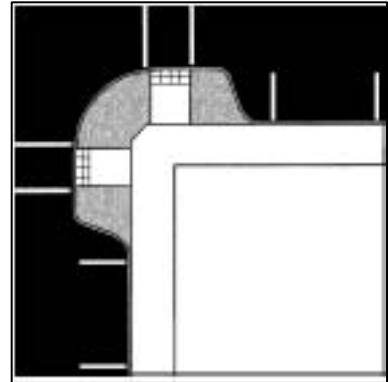


to greet a level sidewalk makes the driver more aware that they are crossing into the pedestrians' territory, and makes the sidewalk more agreeable to the user.

Curb Extensions

Curb extensions can be installed into places where the sidewalk can project into the roadway such as near planting strips, furniture zones, or where on-street parking is provided.

- The curb/walkway should protrude out to the width of the parking spaces at intersections. This:
 - tightens the curb radius;
 - reduces the length of the crosswalk;
 - gives drivers better visibility;
 - restricts fast turns.
- Limiting right turns on red may decrease the chances of pedestrians being hit by right-turning vehicles. The above curb extension treatment reduces the common collision between fast-moving vehicles turning right on a green light and pedestrians crossing with the green light.



A curb extension (Image Source: United States Department of Transportation)

Crosswalks

Every effort must be made to ensure the safety of locations where pedestrians and vehicles will cross paths, and visibility is vital. Every intersection (even small neighborhood crossings) should receive some visual clue to automobile drivers that pedestrians may be crossing, whether it is a sign, pavement markings, flashing warnings, or all of the above.

Eight-foot to ten-foot wide crosswalks are recommended, with 6 feet being the absolute minimum (most likely in neighborhoods). Wider crosswalks could be used in locations with higher



Even many small neighborhood roads could have crosswalks

pedestrian volumes or where the crosswalk needs to be more conspicuous. Crosswalk lines of 10-12 inches of width are the recommended minimum for the standard double horizontal bar crosswalk, but may differ for the thicker-lined *Piano* style crosswalk illustrated in Exhibit 5-1. Crosswalks must line up with curb cuts. Other recommendations include the following:

- The shorter the crosswalk the better. Minimize intersection widths with curb extensions, decreased lane widths, or pedestrian refuge islands (explained in more detail on page 5-8).
- Pedestrian refuge islands are important safety considerations for any crossing point. These should be included in every intersection or mid-block crossing where there is more than one



Albemarle Comprehensive Pedestrian Plan

travel lane in any direction or on two lane arterial roads that have a significant vehicle or pedestrian volume.

- Countdown signals give pedestrians a clear understanding of the amount of time that they have to cross an intersection and should eventually be placed at every signalized intersection in Albemarle.
- A continuous travel path from sidewalk on to crosswalk is necessary.



Although this crosswalk includes positive features such as a countdown signal, a pedestrian refuge island, and detectable warnings, it fails to line up with the curb cuts.

- All sidewalks must have adequate curb cuts, ramps, landing areas, and detectable warning plates (See Section 5.4). These curb cuts must align exactly with crosswalks and pedestrian refuge islands.
- Provide clear, consistent white markings (Zebra, Ladder, or Piano bars are recommended). Textured crosswalks such as brick are not recommended because they may cause difficulties for the disabled and are less visible to the motor vehicle driver than the crosswalks recommended here. See Exhibit 5-1 for examples of crosswalk types.

- Bring the road to meet the sidewalk rather than the sidewalk to meet the road at driveways wherever possible. This reduces travel problems for the disabled and alerts drivers that they are crossing a pedestrian zone.
- ADA ramps should be a minimum of 8 feet wide.


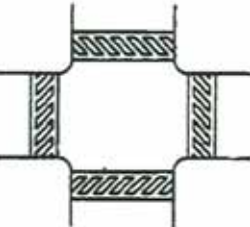
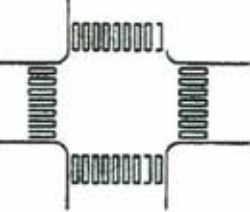
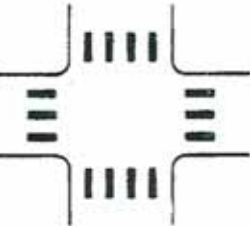
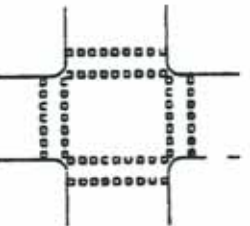
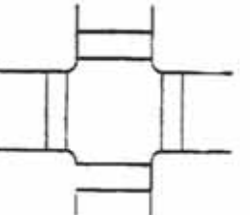
Combining safe crosswalks with traffic calming devices (explained in more detail in Section 5.3) such as raised crosswalks and curb extensions are useful in commercial, residential, or mixed use areas with high amounts of vehicular and pedestrian traffic.



A raised crosswalk connecting a parking lot to a storefront, but lacking paint markings that would increase visibility



Exhibit 5-1: Types of Crosswalk Markings
 (Source: Washington DOT, *Pedestrian Facilities Guidebook*)

MARKING PATTERNS	ADVANTAGES	DISADVANTAGES
 <p>HORIZONTAL BARS</p>	Common practice at stop-controlled intersections, less expensive, easy to install and maintain.	Not as visible as some other marking types; bars tend to wear faster than other types; not appropriate for mid-block locations.
 <p>ZEBRA</p>	Highly visible.	More maintenance required since wheel friction rubs off diagonal stripes; surface can be slippery.
 <p>LADDER BAR</p>	Highly visible.	Wider stripes rub off with wheel friction, but can be placed to minimize this effect; surface can be slippery.
 <p>PIANO</p>	Highly visible and becoming more commonly used; easy to maintain since stripes can be placed outside the wheel friction areas.	
 <p>DASHED (European)</p>	Captures attention because it is not a commonly used pattern.	May not define space as well as some other choices.
 <p>SOLID</p>	Visible (but may not be as eye-catching as other patterns); not commonly used.	Expensive; more difficult to install and maintain; surface can become slippery.



Mid-Block Crossings

- Install only on roads with a speed limit of less than 45 MPH.
- Do not install within 300 feet from another signalized crossing point.
- Base installation of a mid-block crossing on an engineering study or pedestrian route.
- These crossings are recommended near schools, pedestrian routes, retail areas, recreation, and residential areas.
- Require advance warning signs and good visibility for both the driver and the pedestrian. Placing a stop bar with signage a few car lengths before the crosswalk will ensure better visibility for the vehicles and the pedestrian.
- Providing a safe crossing point is necessary since pedestrians will not walk far for a signalized intersection.
- Provide an audible tone at signalized crosswalks.
- Include a pedestrian refuge island on wide streets where:
 - There are fast vehicle speeds or large vehicle or pedestrian traffic volumes.
 - There is more than one travel lane in any direction.
 - Children, people with disabilities, or elderly people would cross.
 - There are complex vehicle movements.
 - There is insufficient time to cross the entire road because of traffic demands.



A Mid-block crosswalk in Charlotte, NC that has piano-style markings and a pedestrian refuge island

Pedestrian Refuge Islands

These are 4-6 foot wide and 8-12 foot long refuges that are physically separated from motorized traffic, and can be in the center of two directions of traffic as the one pictured here, or can offer pedestrians a safer place in between right turning vehicles and through traffic (pork chop refuge islands). Some benefits to these refuge islands are that they:



Center turn lanes offer safety island opportunities

- enable pedestrians to focus on crossing each direction of traffic separately and provide a safe place in the middle of the street to wait;
- offer shorter crossings and improve safety at heavy right-turn traffic intersections;
- place pedestrians in a better position to see oncoming and turning traffic, and allow drivers to more clearly see pedestrians.

Pedestrian Signals at Intersections

- A displayed automatic *Walk* signal with a countdown is recommended at all intersections when pedestrians have the right-of-way to cross, whether or not the button was activated.
- Timed signals should display the entire countdown phase until it reaches zero, when all pedestrian and vehicle traffic



Countdown signals allow pedestrians to cross with more certainty



should get a red light in that direction. Pedestrian signals should display a walk symbol at all times when the pedestrian has the right of way, and include the countdown as soon as the signal is scheduled to change.

- A safe and adequate time must be allowed for any pedestrian to cross who may already be in the intersection. A 3.8 ft/s walking speed is recommended for timing pedestrian clearance intervals at locations with normal pedestrian demographics (i.e., downtown areas, shopping areas, most neighborhoods, schools areas) or locations where the age or physical disability status of the pedestrian population is unknown. When the proportion of pedestrians over the age of 65 exceeds 20, 30, 40, and 50 percent of the total pedestrians at a location, walking speeds of 3.6, 3.5, 3.4, and 3.3 ft/s, respectively, are recommended for pedestrian clearance timings. A 2.9 ft/s walking speed is recommended for intersections where nearly all of the pedestrians are over age 65.
- Clear, consistent activation buttons 42" high are necessary where these buttons are preferred.
- Countdown signals can be installed 7 – 10 feet high.
- Visible signs should be placed in the medians for automobiles to be reminded that North Carolina State Law requires vehicles to stop for pedestrians in both marked and unmarked crosswalks.



Examples of common signage at signalized crosswalks

Signalized Mid-Block Crossings

The in-pavement flashing light crosswalk is a mid-block crosswalk that is better visible to motorists than crosswalk markings alone. The HAWK signal is a mid-block crosswalk that is used on roads where the pedestrian would require help crossing with a signal. This system uses traditional traffic and pedestrian signal heads but in a different configuration. It includes a sign instructing motorists to “stop on red” and a “pedestrians” overhead sign. There is also a sign informing pedestrians on how to cross the street



In-pavement flashing crosswalks improve visibility



A HAWK signal in Tucson, Arizona

safely. When not activated, the signal is blanked out. The HAWK signal is activated by a pedestrian push button. The overhead signal begins flashing yellow and then solid yellow, advising drivers to prepare to stop. The signal then displays a solid red and shows the pedestrian a “Walk” indication. Finally, an alternating flashing red signal indicates that motorists may proceed when safe, after coming to a full stop. The pedestrian is shown a flashing “Don’t Walk” with a countdown indicating the time left to cross.



Shared-Use Paths



A shared-use path on an old rail corridor in Madison, Wisconsin

Shared-use paths are intended to serve walkers, wheelchair users, runners, bicyclists, or any other non-motorized mode of transportation. These facilities may also be referred to as “greenways,” or greenway trails and should not be confused with sidewalks that share the right-of-way with vehicular roads, nor with “Greenbelt Buffers” that are not necessarily intended to accommodate public access. Shared-use paths can act both as pedestrian walkways and as vegetative buffers with an ecological function. Besides encouraging the reduction of all of the harmful environmental effects of automobile use, these trails can also stimulate the acquisition and conservation of wildlife corridors, be associated with stream improvement projects, and give people a healthy respect

for their natural surroundings by making public open space more accessible.

Shared-use paths need to be a minimum of 10 feet wide; with minimum 2 foot wide graded shoulders on each side (AASHTO recommends 5 foot shoulders) to protect users from grade differences. These shoulders can be grass, sand, finely crushed rock or gravel, natural groundcover, or other material. Sections of the trail where shoulders are not possible because of stream crossings or other elevated grade issues should have protection such as rails, fences, or hedges. Parks and urban corridors tend to be highly-used sections of these trails and should possibly be wider. If it is not possible to increase the width in these popular sections, consider including a stripe down the center to indicate bi-directional traffic, especially around sharp or blind curves.

The alignment of these corridors should avoid road right-of-way whenever possible to minimize intersection and driveway crossings. Because these paths typically do not cross roads at signalized intersections, they should include pedestrian crosswalks, underpasses, converted culverts, or overpasses at each road crossing for safety. Vertical clearance of 8 feet is required for safety of all users, and structures and shrubbery should not extend horizontally into the corridor. A vertical clearance of 10 feet is recommended for underpasses and culverts. Safe road crossings are very important in creating a successful shared-use path. Proper crossings should be included in all design for these paths.



This underpass was designed and built during bridge construction



These paths should follow the contour of the land for aesthetic and environmental reasons, but for practical reasons should not be unnecessarily curved. The minimum radii or curvature recommended by AASHTO is 30-50 feet, and the cross slope should typically be less than 2%. The grade should not be more than 5%, but could reach 11% for short distances according to



A shared-use path along a sewer easement in Charlotte, NC

ADA and AASHTO guidelines. Right angles should be avoided for safety reasons, especially when considering bridge and road crossings.

Environmental protection should be a priority with the planning and construction of a trail. Trail design, construction type, and construction schedule should all reflect environmental considerations. For example, a trail offers some leniency with its alignment compared to a sidewalk, offering opportunities for selective clearing of vegetation. Also, asphalt may not be considered a good surface material in wet areas because of its

petroleum base, and construction during certain months of the year may disrupt wildlife nesting.

These trails should be open at all hours so that it can serve as a reliable transportation route. Lighting is not necessary and not recommended except through underpasses and culverts, and near safety hazards such as curbs, sharp directional changes, road crossings, obstacles, or ending points, and some high-use areas such as parks and urban locations. A reflective center stripe or markers would help to make this trail navigable in limited light. Lighting the trail itself can restrict the visibility of areas beyond the trail. Existing street and structure lighting in urban areas can effectively and adequately light the adjacent trail. For safety reasons, a requirement that states that all bicycles and skaters carry lights and all pedestrians wear reflective clothing during non-daylight hours would be useful.

We recommend that these paths should be surfaced with a hard material that allows for easy walking and bicycling. Asphalt is cost effective and practical in most terrains, while concrete and boardwalks are best suited for flood prone (culverts and underpasses) or wet areas (wetlands and creek borders). Finely crushed stone or granite screening (rock dust) is a cost effective alternative that may be used outside of high traffic urban areas. Private motorized vehicles of any kind (besides motorized wheelchairs for legally disabled citizens) should never be allowed access to these trails. A summary of our recommendations for two-directional traffic shared-use trails is below:

- Trails adjacent to roadway
 - Minimum 10 feet wide. (12 feet preferred)
 - Minimum 10-foot planting strip. (except for intersection approaches)
 - A cross slope of 2% is recommended.
 - Grades of less than 8.3% are required, with more than 5% being treated as a ramp.
 - Minimum 2-foot graded shoulder on each side, with 5 feet preferred.
 - Asphalt is the best surface for multiple users such as bikes and roller blades. Concrete is a good alternative in flood-prone areas such as culverts, while boardwalks are best in



frequently wet parts of the trails. Very fine gravel or Granite Screenings (rock dust) is a cost-effective substitute in rural areas and can accommodate pedestrians and most bicyclists; however, non-paved trails may have higher maintenance costs.

- Minimize intersection and driveway conflicts; path should stay level over driveways. Non-paved driveways should have paved bibs to restrict debris accumulation.
- On separate right-of-way
 - Minimum 10 feet wide. (12 feet is preferred in high use areas)
 - A cross slope of 2% is recommended.
 - Grades of less than 5% are required, with occasional grades up to 11% for short distances.
 - Minimum 2-foot graded shoulder on each side with 5 feet preferred.
 - Asphalt is best surface for multiple users such as bicycles and roller blades. Concrete is a good alternative in flood-prone areas such as culverts, while boardwalks are best in frequently wet parts of the trails. Very fine gravel or granite screenings (rock dust) is a cost-effective substitute in rural areas and can accommodate pedestrians and most bicyclists; however, non-paved trails may have higher maintenance costs.

Examples of typical shared-use path cross-sections are shown in **Appendix D**. An upland shared-use path cross section from NCDOT's guidelines is shown separately from an example of a floodplain example from Mecklenburg County Parks and Recreation.

Lighting, Landscaping, and Signage

Lighting

- Use lighting that is appropriate for the pedestrian scale, not the automobile scale. When lighting is not feasible or desirable (such as on suburban or rural sidewalks or greenways,) reflective materials on signs or paint striping on pavement can be used to guide pedestrians.
- Well used pedestrian areas such as Central Business Districts, Neighborhood Business Districts, and parks should have appropriate lighting.
- Determine a need for lighting before installing it. In many cases, lights can make visibility poorer in areas beyond an off road path, which causes some uneasiness for pedestrians. Lighting should be standard where pedestrians cross under a structure, or when the sidewalk or path has obstacles such as curbs, steps, roadway crossings, or abrupt directional changes.



Lighting should be to the pedestrian scale

Landscaping

- Native vegetation should be used to minimize maintenance and long term costs.
- Use low height shrubs near crossings or transit stops.
- The limbs of large canopy trees should not encroach within the walking area.
- Some tree species have more damaging root systems than others and should not be planted in tight planting strips or without root barriers.
- Planting strips should be wide enough to accommodate the vegetation planted. Large canopy trees need 5 – 8 feet, with 8 feet being preferred.

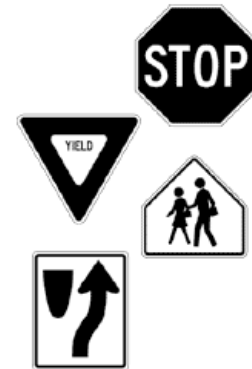


- Space large canopy trees evenly to provide adequate shade (25-50 feet apart). Small canopy trees might be spaced 20-25 feet apart.
- Utilize smaller canopy trees when conflicting overhead utilities are present.
- Recent studies suggest that the cover that trees provide sidewalks actually increase their lifespans. It may not be appropriate to use sidewalk cracking issues as a reason not to include trees in a pedestrian plan.
- Consider trees that are low maintenance. Evergreen or tardily deciduous trees that continually drop too many leaves or acorns throughout the year would need constant attention. Deciduous trees that only drop leaves once in the year are easier to maintain.

Signage

- Signage is typically used for regulatory, warning, or way-finding purposes.
- Signage should be minimal.
- Signage should be aesthetically appealing.
- Signage should be maintained to be readable.

Signing is governed by the Manual on Uniform Traffic Control Devices (MUTCD), which provides specifications on the design and placement of traffic control signs installed within public rights-of-way. The MUTCD encourages a conservative use of signs (Sections 2A-1, 2A-6, 2B-1, and 2C-1). Signs should only be installed when they fulfill a need based on an engineering study or engineering judgment. In general, signs are often ineffective in modifying driver behavior, and overuse of signs breeds disrespect. Used judiciously and located with consistency, signs and markings can be effective.



Planners have a variety of regulatory and warning signs that can be used to increase pedestrian safety

The MUTCD outlines guidelines governing signs and pavement markings but it does not prohibit any creative design. Colors for signs and markings should conform to the color schedule recommended by the MUTCD to promote uniformity and understanding from jurisdiction to jurisdiction. For the background color of signs, use:



This crosswalk in Mooresville uses a Pedestrian Crossing street sign, an in-street warning sign and pavement markers

YELLOW & FLUORESCENT YELLOW/GREEN - General warning
 RED - Stop or prohibition
 BLUE - Service guidance
 GREEN - Indicates movements permitted, directional guidance
 BROWN - Public recreation and scenic guidance
 ORANGE - Construction and maintenance warning
 BLACK - Regulation
 WHITE - Regulation

Warning signs are used to inform unfamiliar motorists and pedestrians of unusual or unexpected conditions. Advance pedestrian warning signs should be used where pedestrian crossings may not be expected by motorists, especially if there are many motorists who



are unfamiliar with the area. A new fluorescent yellow/green color is approved for pedestrian, bicycle, and school warning signs (Section 2A.11 of the MUTCD). When used, warning should be placed in a way that allows adequate response times. Warning signs are generally diamond-shaped with black letters or drawings on a yellow background and shall be reflectorized or illuminated.

Regulatory signs, such as STOP, YIELD, or turn restrictions require certain driver actions and can be enforced. Warning signs can provide helpful information, especially to motorists and pedestrians unfamiliar with an area. Some examples of signs that affect pedestrians include pedestrian warning signs, motorist warning signs, NO TURN ON RED signs, and guide signs.

North Carolina General Statute § 20-173 states that vehicles must yield to pedestrians in any marked crosswalk or within any unmarked crosswalk at or near an intersection. Each intersection should be marked with the proper crosswalk and some intersections may benefit from signs reminding drivers of this law.



Signs may be placed on pavement, furniture, or other locations

Sample costs for these items shown in Section 5.2 are given in **Appendix E**.

5.3. TRAFFIC CALMING INITIATIVES

Tightening Turns and/or Extending Sidewalks

Tightening turns at intersections will force motorists to reduce their speeds and will give drivers a better angle-view on approaching traffic and pedestrians while decreasing the length of the crosswalk for pedestrians. This solution enhances pedestrian safety at all intersections, and would greatly improve the safety at major intersections where vehicles make quick turns. A drawback to this is that standard intersections with minimum turn radii increase fuel efficiency because vehicles can make rolling stops more easily and that design can therefore decrease air pollution. Pedestrian islands (pork chops) at these right turn locations where it is desired to keep traffic moving can make it a little safer for pedestrians, and still save motorists fuel costs. This technique, however, is still not optimum for the pedestrian and should be limited to select major intersections. Each new intersection and driveway should be constructed according to new guidelines that address these considerations.



Albemarle has a curb extension downtown. Pedestrians have less road width to cross and cars are forced to slow down to make right turns.



Road Diets (Lane Conversions)



A lane conversion creates bike lanes from motor vehicle lanes and a new center turn lane.

Roads with two or more wide travel lanes in each direction (or one very wide travel lane) and no designated left turn lanes may be evaluated for the possibility of applying a “road diet”. This lane conversion typically reduces the widths of and/or the number of motor vehicle travel lanes in each direction, includes designated center left turn lanes with occasional median strips for pedestrian crosswalks, and adds bicycle lanes. This configuration will allow through traffic to keep a constant pace without stopping for turning vehicles, supports alternate forms of transportation, provides buffers for pedestrians on the sidewalks, slows traffic to the posted speed limit, and may give pedestrians safer crossing opportunities.

Some studies show that this configuration could be safer and can be more efficient as a traffic mover than some other roadway configurations. The ideal roadway for this conversion is often a four-lane road carrying 12-18,000 auto trips per day, but upper limits of 20-25,000 ADT are also achievable on some roadways without decreasing their capacity. No specific roadways in Albemarle were studied for this practice in this report, but it may be a conceivable alternative in the future for conversion plans that meet specific objectives.

Back-in Diagonal Parking

A new method of on-street diagonal parking has some positive benefits to pedestrians. Instead of diagonal parking that allows a car to quickly enter a space, and then have to back out of it rather blindly, some towns have been considering diagonal back-in parking. This method requires the driver to pull in front of the space on the roadway and then back into the parking slot. This gives easy access for the driver, the passengers, and the car’s payload to the sidewalk without having to first shut the door. The open door also acts as a buffer to keep small children from moving towards the roadway when they exit the car. When the car is ready to leave the parking space, the driver has a clear view on their side of the vehicle of the oncoming traffic and can maneuver easily into the flow. Uncertain maneuvers into traffic and speedy turns into parking spaces that may have pedestrians blocked from view are eliminated.

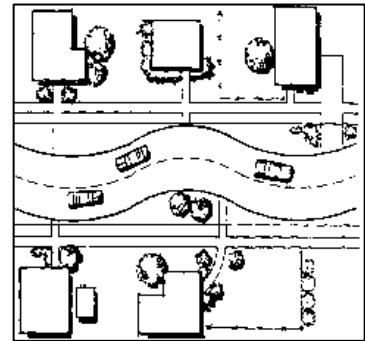


*Back-in diagonal parking has benefits for pedestrians
(Photo by Michael Ronkin)*



Alternate On-Street Parking and Chicanes

Where there is space for on-street parking on only one side of the street on low-speed roads, consider striping the travel lanes so that the parking spaces alternate from one side of the street to the next with each block or half block. This will give the road a serpentine shape and naturally reduce the speed of traffic. Roads through downtown that currently have some on-street parking and that have speed issues may be candidates for this treatment. Chicanes can also be artificially created by adding landscaping, changing lane striping, or by creating pedestrian refuges with crosswalks. (This picture and other traffic calming techniques can be found on the Federal Highway Administration's Web Site at <http://www.ite.org/traffic/tcdevices.htm>)



Chicanes can be developed on wide streets to help maintain a desired traffic speed

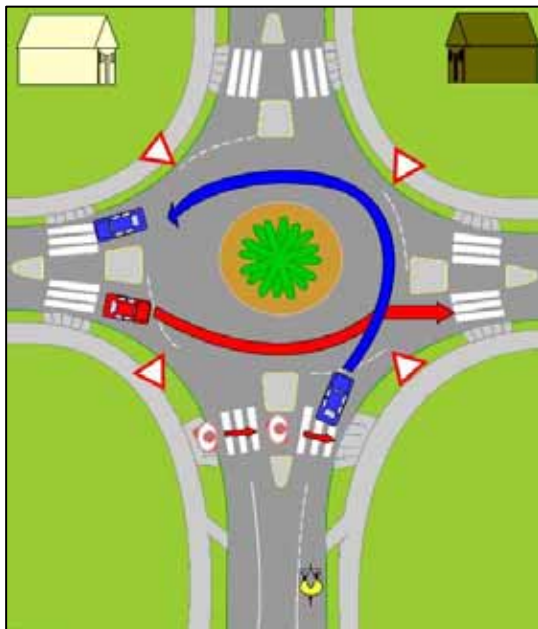
All-Way Stops and Yields



A four way yield intersection, with some modification, can become a mini-roundabout

Neighborhood road intersections that currently have a stop in one direction can be modified to have a stop or a yield in all directions, if other speed controls are already in place. This photo shows a four-way yield, but this location can easily be made safer for pedestrians by including a mini-roundabout in the middle of this intersection.

Roundabouts



This roundabout image from Yorkton, Canada shows crosswalks, safety islands, and optional bike exits for inexperienced cyclists who prefer not to take the lane.

Roundabouts are great for pedestrians, bicycles, and automobiles, despite the fears from those who are unfamiliar with these traffic control devices that are popular worldwide. Roundabouts limit potential conflict points because the automobiles and bicyclists are unable to make left turns. Instead, the vehicle moves in a counter-clockwise direction around the circle, and turns right at their chosen road. Vehicles get through the intersection more quickly, even though their speed is lower. Since these traffic speeds are slow, bicyclists can move into the travel lanes as if they were a larger vehicle.

Pedestrians and novice bicyclists use sidewalks and crosswalks (sometimes with



A mini-roundabout in Madison, WI



pedestrian refuge islands) on the outside of the roundabout, and have been shown to have fewer collisions with vehicles at these roundabouts than with conventional intersections.

Narrowing Residential Streets with Striping

On low volume neighborhood roadways where some streets currently have no sidewalks, pedestrians sometimes choose to use portions of the roadway for walking. While this practice is allowed by law, it is important that vehicle speeds be controlled for safety purposes. This is particularly true when street lanes are so wide that drivers feel less constricted and can travel at speeds not conducive to safely sharing the roadway with pedestrians or young cyclists. Narrowing lanes and other traffic-affecting policies are effective in reducing vehicle speed on streets with or without sidewalks.



A striped shoulder in Albemarle

When retrofitting to install sidewalks in neighborhoods is not currently feasible, reducing vehicle lane width, and thereby vehicle speed, on these broad neighborhood streets will increase safety for pedestrians sharing the street with vehicles. Standard 9½ to 10½-foot lanes can be established by installing outside boundary lines with either paint or thermoplastic striping. While thermoplastic striping costs more, it will last significantly longer than will lines of standard paint, although standard paint will likely last for years on lower-volume streets. This practice is best on roadways with speed limits of 25 miles per hour or less, and with an ADT of 3,000 or less.

The opportunity for on street parking does not necessarily need to be removed to accomplish this. If the newly striped shoulder is less than seven feet wide (including gutter pans), cars parked along a street in these margins can effectively create a chicane for vehicle drivers, and also contribute to slowing traffic. Margins seven feet wide (including gutter pans) can adequately fit vehicles, but pedestrians will be forced to cautiously walk around them. On-street parking should not be allowed near intersections or other common pedestrian crossing points.

Pedestrians who choose to use the areas outside the painted lanes must still comply with local and state law. North Carolina General Statute § 20-174 specifically states that pedestrians must



Striped shoulders in Albemarle wide enough for on-street parking

use sidewalks where they are provided. When no sidewalks are provided, pedestrians should walk facing traffic and must yield right of way to vehicular traffic, while vehicle drivers must use due care to avoid pedestrians on the roadway. The presence or the expectation of pedestrians on a street may also slow traffic on these neighborhood roadways.

Experienced bicyclists should use, and be expected to use, the vehicle lanes. Young and inexperienced bicyclists may use the area with the pedestrians, but should ride in the same direction as traffic. This photo shows striped shoulders in Albemarle that are primarily for on-street parking, but still offer decent pedestrian accommodations.



Bicycle Lanes

It is important to understand that sidewalks are not designed for bicycles, and bicycle planning needs to be incorporated with roadway planning or with paved paths off of the road right-of-way. This plan does not provide specific projects or recommendations for bicycles. The previous paragraph describes lane striping specifically for traffic calming, but bicycle lanes are functional lanes for bicycles that also serve to slow traffic and as traffic buffers for pedestrians on the sidewalk. Although neighborhood roads typically have low enough automobile speeds and volumes for cyclists to ride in the vehicle lanes, bicycle lanes on arterial roads offer a perception of safety to bicyclists, and make many drivers more comfortable with sharing the road with a cyclist. NCDOT guidelines require designated bicycle lanes to be a minimum of 4 feet from the edge of the gutter pan to the stripe.



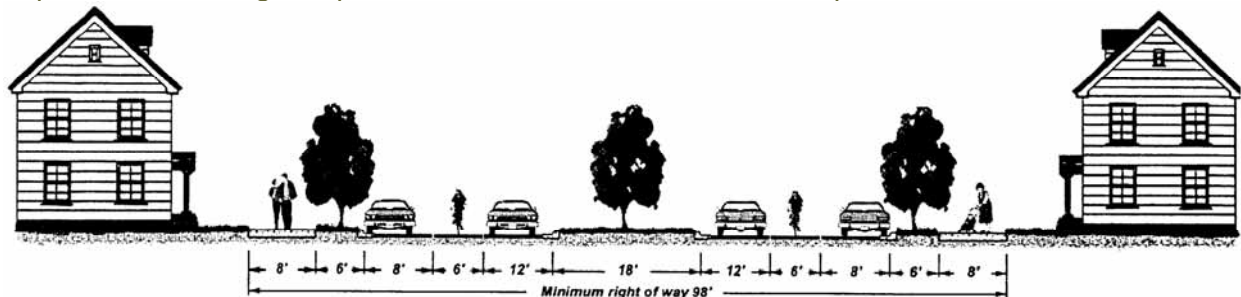
A bike lane in Charlotte, NC

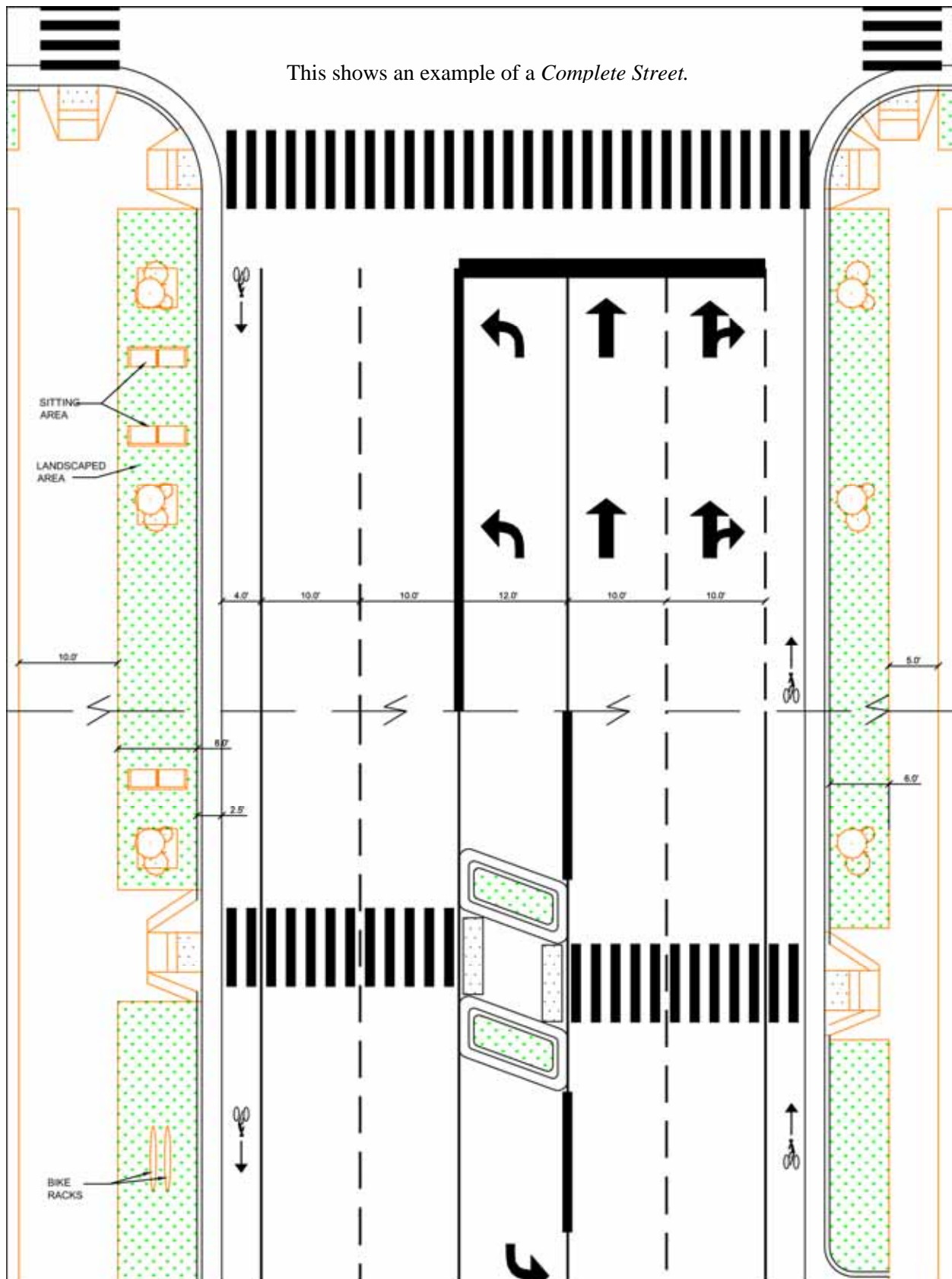
Vehicular Lanes

To keep pedestrians safe and comfortable, roadways in the core of the Pedestrian Districts and in residential areas should keep traffic speeds at a maximum of 20-25 mph. Keeping motor vehicle lanes at a width of 9.5' – 10.5' with other traffic calming features could naturally keep speeds limited. 30-40 mph roadways should have 11' wide inside travel lanes and 12' outside lanes, but 35 MPH roadway lanes can be as narrow as 10' if separate bicycle lanes exist, and outside lanes can be as wide as 14' if they are meant to be shared travel lanes for bicycles and automobiles. Roadways that are 45 mph or greater are not recommended within Pedestrian Districts, and travel lane widths depend on a range of existing conditions.

Designing “Complete Streets” that provide accommodations for pedestrians, bicycles, and motor vehicles are the optimal means by which vehicular traffic and pedestrian traffic can coexist. The Federal Highway Administration states that, “Bicycling and walking facilities will be incorporated into all transportation projects unless exceptional circumstances exist.” Albemarle and NCDOT need to adopt a *Complete Streets* policy as well. A good resource that should be obtained from the North Carolina Department of Transportation is their *Traditional Neighborhood Development Street Design Guidelines* from July 2000. The cross-section below is from those guidelines. This manual goes into further detail on design speeds, street widths, on-street parking, sidewalks and other street features and can be found on-line at:

<http://www.ncdot.org/doh/preconstruct/altern/value/manuals/tnd.pdf>.





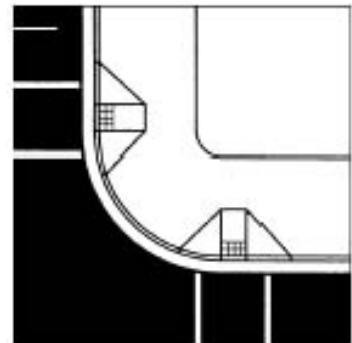


5.4. AMERICANS WITH DISABILITIES ACT (ADA) FACILITY TRANSITION PLAN



Lack of pedestrian planning in this NC neighborhood disadvantages the disabled population as well

Title II of the Americans with Disabilities Act of 1990 (ADA) requires that local governments complete a Transition Plan that describes how that municipality will upgrade its existing public right of way facilities so that they are compliant with ADA. This plan was supposed to be complete for states and larger municipalities by July of 1992; with modifications done by January of 1995. The US government and the disabled community realized that this goal was lofty, but now, ten years later, it is likely that its



This is a good design



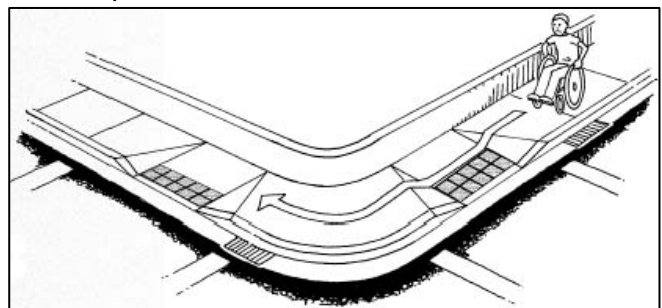
New sidewalks with ADA considerations.

provisions will be expected to be completed. In some instances, comprehensive pedestrian plans have served as the Transition Plan for municipal and state governments around the country.

This plan recommends that the City of Albemarle takes special care to make certain that each and every right-of-way project done in the City incorporates upgrades to its existing pedestrian features such as curb ramps, sidewalk maintenance, and crosswalks that will satisfy ADA guidelines. This includes, but is not limited to: sidewalk and crossing cross slopes, sidewalk widths, surface, grades, curb cuts, ramps, landing areas, gaps, obstacles, detectable warnings, and signals. The illustrations here show some of the problems, issues and solutions that are

involved with the proper planning for disabled pedestrians. Placing curb ramps out of the travel area, making sure to accommodate all users once they are in the vehicle right-of-way, and providing detectable warnings on the ramps for the visually impaired are some of the many improvements that can be done. These illustrations and a lot more information and guidance on this topic are located on the United States Department of Transportation's web site at:

<http://www.fhwa.dot.gov/environment/sidewalk2/sidewalks207.htm>



Curb cuts and ramps without a minimum 6 foot buffer from the curb create dips and the absence of adequate landing areas.